

University Program

Two concerns:

- *the priority of the university program*
- *the next 5 years*

Our theme has been:

Can we do what we're approved to do?

- *The facts:*

1. **HEP has been successful in generating support for important experimental programs**

- *Discovery potential is assured for more than a decade*
 - in anticipated ways (which is how we argue for the projects)
 - in surprising, unanticipated ways (how unusual things happen historically)

2. **These programs are overlapping in time**

3. **Physicists from the University PI Programs make these experiments happen**

4. **But, overall, the PI grant programs are not as healthy as the facilities require**

- *high priority, visible projects are increasing, the diffuse, not-visible PI programs are not*
- *unlike labs, large experiments, the PI programs lack focused, vocal, visible champions*

Our plate is full of rich offerings

Running experiments:

- *Fermilab (DØ, CDF, MiniBooNE)*
- *SLAC (BaBar)*
- *KEK (Belle, K2K)*
- *Cornell (CESR-c)*
- *DESY (Zeus, H1)*
- *non-accelerator (SuperK, LIGO, Auger, AMANDA, Ice Cube, MILAGRO, VERITAS, SNO, CDMS, KamLAND, ...)*

Approved, future experiments:

- *CERN (Atlas, CMS, LHC-b)*
- *Fermilab (NuMI/MINOS, BTeV)*
- *BNL (RSVP [MECO/KOPIO])*
- *non-accelerator (GLAST, T2K, AMS,...)*

Anticipated experiments/facilities:

- *Fermilab (NOvA)*
- *CERN (LHC upgrades)*
- *earth (LC)*
- *non-earth (SNAP, ...?)*
- *non-accelerator (Underground Laboratory & expts,,...)*

overlap in time with
many of these

many of these

“Redirection” is the planned
solution...

we tend towards transportation metaphor

The Roadmap idea

...implies a journey to a destination

- *But judging our success solely by Luminosity goals or construction deadlines*

is like declaring as successful a transportation system built on-time with flat, dry surfaces – but no traffic

We obviously have to build the roads

...the laboratories do that, and do it well

- *But then we have to construct the cars, drive the cars, read the map, and repair them when they fail*

The destination is the goal, not the highway

- *We have a set of running experiments built at great public expense and with 1000's of person-years of effort*

It would be the height of irresponsibility to harm their ability to reach agreed-upon goals

“users”

Is there still misunderstanding?

- *The NSF/DOE supported university community does not passively wait by the phone for Laboratories to call with “data”*

The supported university community

- *conceives of the need for experiments and facilities*
- *most often leads the projects*
- *dominates the design of the experiments*
- *engineers much of the experiments*
- *constructs much of the experiments*

- *collects and certifies most of the data*
- *analyzes most of the data*
- *writes most of the papers*
- *publicizes most of the results*

In collaboration with the laboratory scientific staff

- *So, two very different tasks for the PI program*

① design/construction and ② operations/analysis

- *we understand and quantify the former,*
- *but devalue and underestimate the latter*

a visible, labor-intensive activity...the beginning

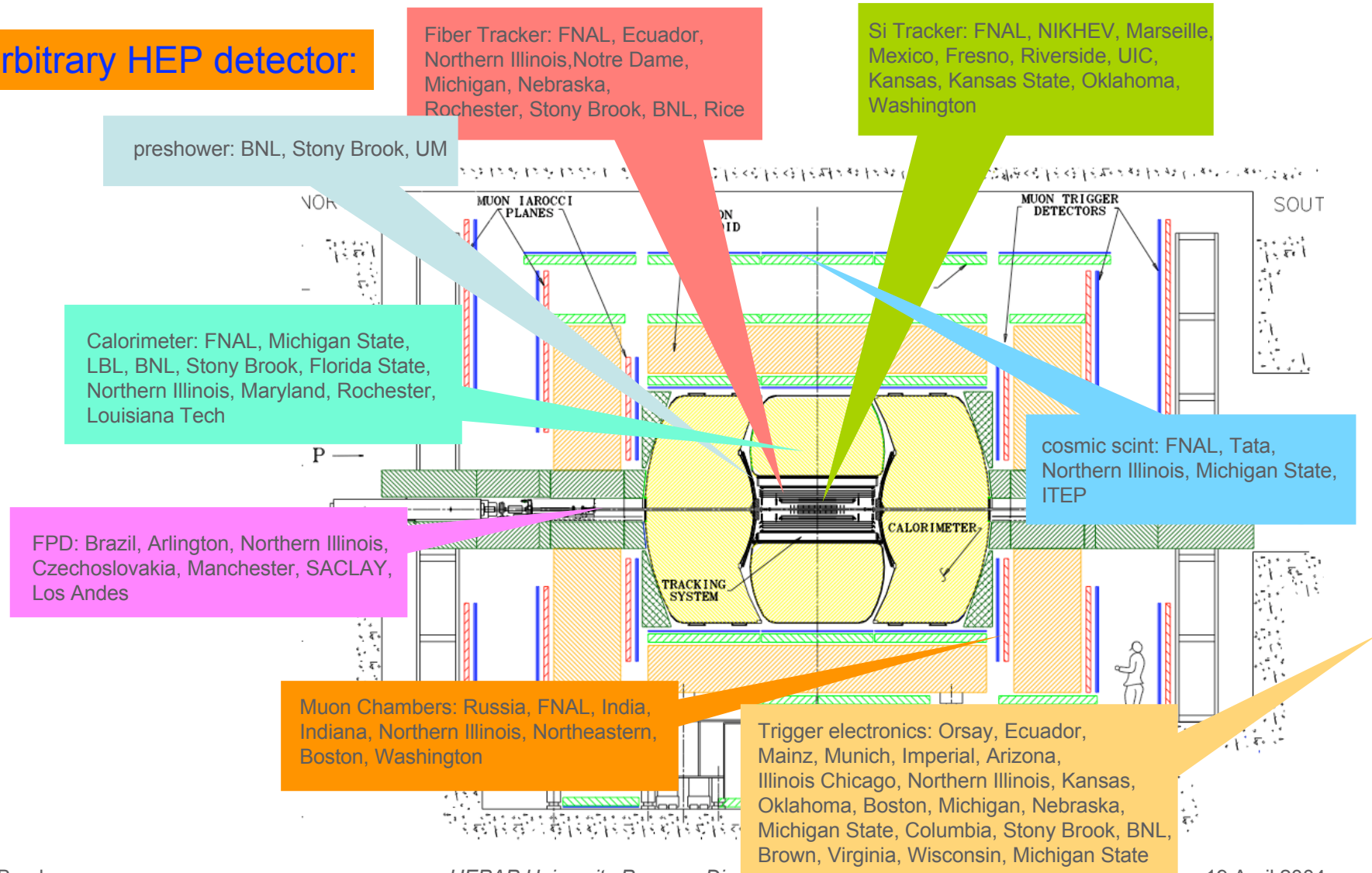
a less-visible, still labor-intensive activity...

THE GOAL

Job # 1 : Design and construction

- post docs, graduate students, faculty, laboratory staff

an arbitrary HEP detector:



job ② : Operations and analysis

- post docs, graduate students, faculty, laboratory staff:
 - *Maintaining and operating detectors over years is an onerous, labor-intensive job*
they break, they change with age, they exhibit hidden blemishes as more data are collected and the systematic uncertainty analyses become more difficult
 - *Reducing the data, reprocessing the data, producing the Monte Carlo*
requires cleverness and labor-intensive efforts, increasingly, world-wide, increasingly anticipating grid efforts before the LHC

This is hard work

- *It's surprisingly difficult to characterize quantitatively and estimate*
- *It's not sufficiently supported to guarantee the success that the Projects deserve*

But, you know what?

- **On the scale of the program and its facilities: It's cheap.**
- *In an \$800M+ program (DOE + NSF)*
The whole essential University Program is ~ 20% of the whole
100 post docs costs <\$10M ~1.25% of the whole program
- *Keep this in mind*

So, back to the original question:

- *Can we do what we have to do - given the 2 sorts of necessary tasks?*

The only way to answer the question is to ask.
So, we did.

With Fred's help, we did a survey

“What are the needs for post docs, students, and faculty/lab staff during this period of overlap?”

- *an Unscientific, scientist survey*

specifically, accelerator-based experiments:

- Running Experiments: CDF, DØ, BaBar, CLEO
- Building Experiments: Atlas, CMS, MINOS, BTeV

Estimate post doc, student, faculty/lab staff needs for:

- *Now, 2004 - reasonably precise, taken as the benchmark*
- *Future, 2005-2009 - fairly imprecise, gave spokespeople fits*
 - *(we requested uncertainties $\rightarrow \pm 20\text{-}50\%$)*

- *And we asked about both:*

“operations”

- *(incl. commissioning, construction) - reasonably precise*

“analysis”

- *very hard to estimate, even for running experiments*

disclaimer and warning

The goal of this exercise was not precision

- *the goal is to probe for trends which might demand future study*

There are intentionally no quantitative conclusions

- *this is too important to leap to conclusions rashly*
- *it is not nuanced: not all post docs/grad students are the same: experts matter*

This carries some risk for the spokespeople

- *All responded with commentary and qualifications*

thank you to all for your help

- *Some indicated, in the end, that the exercise was useful for them*
- *All correctly insist that this is not precise stuff*

I suspect that all could be more precise with more time and crisper definitions

Not all data are the same

- *In general, the running experiments reported NEEDS, while the future experiments reported PLANS*

The latter presume some level of “redirection”

I will focus on post docs

- *a critical community in each experiment*
- *a pipeline we can maybe control and somewhat predict*

The philosophy:

- *If we have a problem*

it's better to know now, rather than 2 years from now.

the form

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2			Experiment	CLEO-c										
3			responder	David Cassel & Ian Shepsey										
4			date	4/16/04										
5														
6		item	ACTUAL	task	FY2004		item	NEEDED		FY2005	FY2006	FY2007	FY2008	FY2009
7		1	operations	FTE post docs-domestic Institution	8.6		1'	operations	FTE post docs	10.7	10.7	10.7	10.7	5.35
8				FTE post docs-host lab	2.1									
9				FTE post docs-foreign Institutes	0									
10		2	operations	FTE grad student-domestic Institution	8.6		2'	operations	FTE grad student	8.6	8.6	8.6	8.6	4.3
11				FTE grad student-foreign Institutes	0									
12		3	operations	FTE faculty-domestic Institutions	1		3'	operations	FTE faculty	8.9	8.9	8.9	8.9	4.45
13				FTE host lab physics staff	7.9									
14				FTE faculty/staff foreign Institutes	0									
15				TOTAL OPERATIONS	28.2				TOTAL OPERATIONS	28.2	28.2	28.2	28.2	14.1
16		4	analysis	FTE post docs-domestic Institution	19.4		4'	analysis	FTE post docs	22.3	22.3	22.3	22.3	22.3
17				FTE post docs-host lab	2.9									
18				FTE post docs-foreign Institutes	0									
19		5	analysis	FTE grad students domestic Institutions	34.4		5'	analysis	FTE grad students	34.4	34.4	34.4	34.4	34.4
20				FTE grad student-foreign Institutes	0									
21		6	analysis	FTE faculty-domestic Institutions	19		6'	analysis	FTE faculty	32.1	32.1	32.1	32.1	32.1
22				FTE host lab physics staff	12.1									
23				FTE faculty/staff foreign Institutes	1									
24				TOTAL ANALYSIS	88.8				TOTAL ANALYSIS	88.8	88.8	88.8	88.8	88.8
25		7	commentary:	how you calculated the overlaps in tasks				Tried to distinguish very carefully between operations and analysis tasks.						
26		8	uncertainties	operations uncertainties - rough	+25%				+25%	+25%	+25%		If program is extended	
27		8	uncertainties	analysis uncertainties - rough	+50%				+50%	+50%	+50%		+50%	+50%
28		9		experiment milestones	CESR Upgrade & psi(3770)				psi(3770)	DS-DSbar	3/psi		Undecided	
29														
30														

some came with milestones

each came with uncertainties

some came with commentary

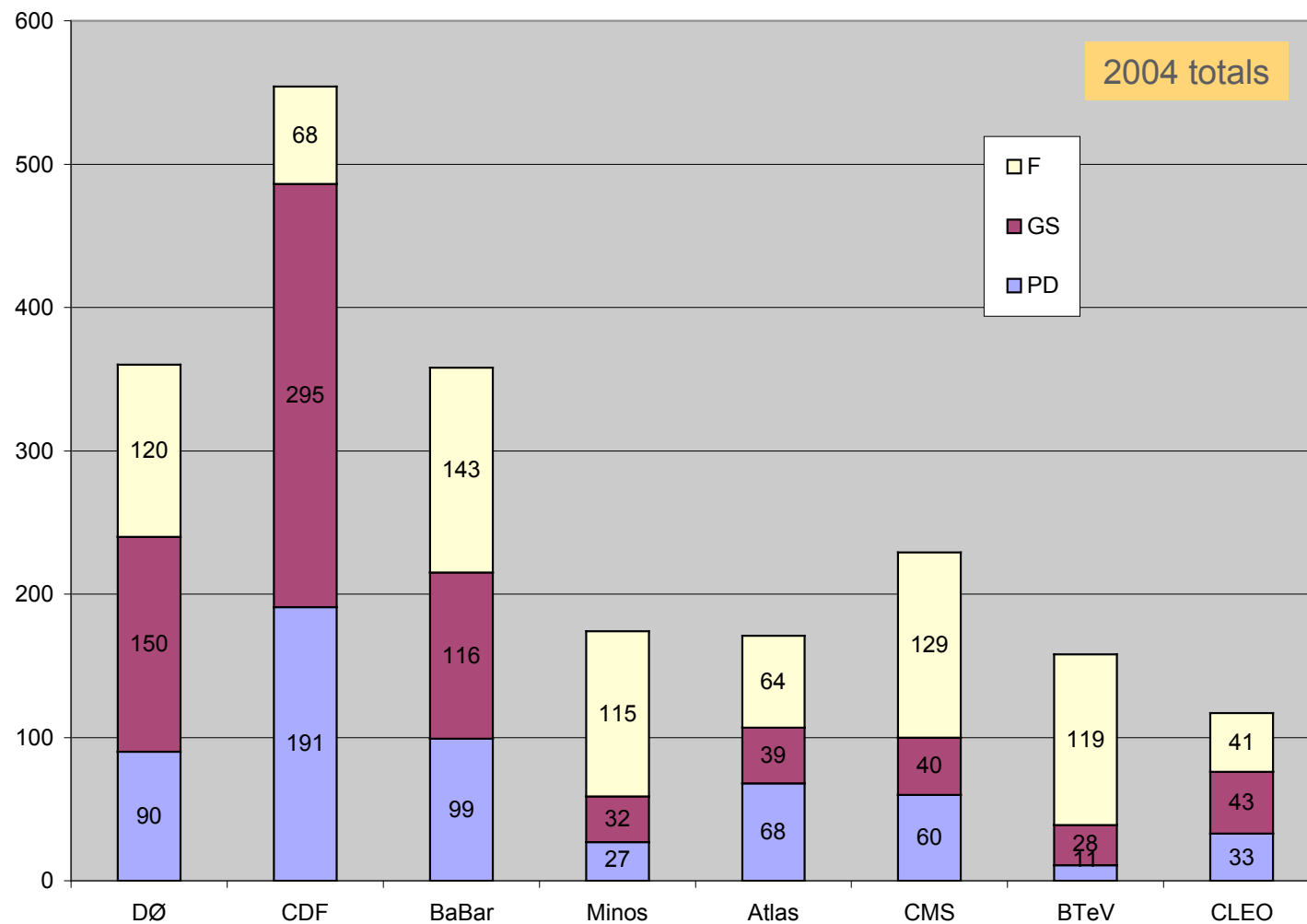
THIS IS ROUGH: meant to suggest/highlight possible trends

19 April 2004

too small to read? yup.

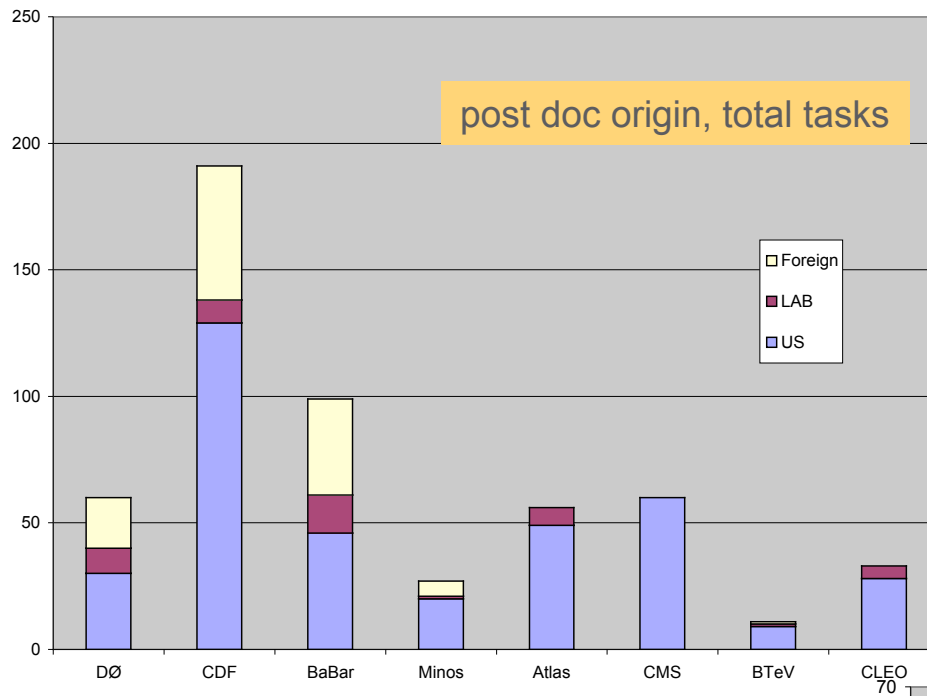
TOTAL										TOTAL									
health										total									
Lab	foreign	2004	2005	2006	2007	2008	2009	2010	2011	Lab	foreign	2004	2005	2006	2007	2008	2009	2010	2011
0	120	225	225	225	225	225	225	225	225	0	120	225	225	225	225	225	225	225	225
11	50	115	115	115	115	115	115	115	115	11	50	115	115	115	115	115	115	115	115
0	0	32	32	32	32	32	32	32	32	0	0	32	32	32	32	32	32	32	32
0	0	32	32	32	32	32	32	32	32	0	0	32	32	32	32	32	32	32	32
0	0	40	40	40	40	40	40	40	40	0	0	40	40	40	40	40	40	40	40
0	10	23	7	54	80	70	74	84	84	0	10	23	7	54	80	70	74	84	84
0	0	49	49	49	49	49	49	49	49	0	0	49	49	49	49	49	49	49	49
11	284	742	742	742	742	742	742	742	742	11	284	742	742	742	742	742	742	742	742
Ops										Ops									
health										total									
0	20	45	45	45	45	45	45	45	45	0	20	45	45	45	45	45	45	45	45
0	5	14	14	14	14	14	14	14	14	0	5	14	14	14	14	14	14	14	14
3	18	39	39	39	39	39	39	39	39	3	18	39	39	39	39	39	39	39	39
0	3	32	32	32	32	32	32	32	32	0	3	32	32	32	32	32	32	32	32
0		19	19	21	21	17	18	18	18	0		19	19	21	21	17	18	18	18
0	40	52	52	52	52	52	52	52	52	0	40	52	52	52	52	52	52	52	52
0	10	23	7	10	13	29	21	34	34	0	10	23	7	10	13	29	21	34	34
0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
3	59	225.8	215.8	229.8	217.8	204.8	219.8	219.8	219.8	3	59	225.8	215.8	229.8	217.8	204.8	219.8	219.8	219.8
analy										analy									
health										total									
0	50	105	115	115	115	115	115	115	115	0	50	105	115	115	115	115	115	115	115
0	115	231	231	231	231	231	231	231	231	0	115	231	231	231	231	231	231	231	231
9	40	77	77	77	77	77	77	77	77	9	40	77	77	77	77	77	77	77	77
	0										0								
	20	35	47	52	59	59	59	59	59		20	35	47	52	59	59	59	59	59
	0										0								
0	0	0	44	42	41	59	59	59	59	0	0	0	44	42	41	59	59	59	59
	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4		94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4
9	205	517	542	563	601	601	619	619	619	9	205	517	542	563	601	601	619	619	619

2004: post docs, students, faculty/staff



These are FTE's and represent from many experiments, bottom-up counting.

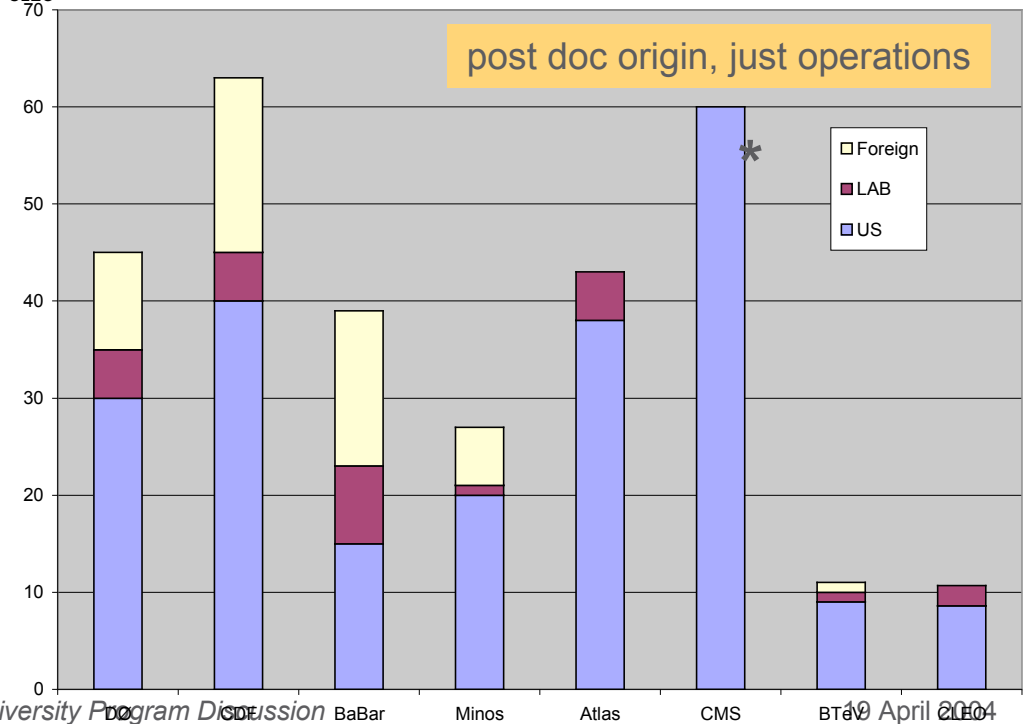
2004: post docs



What you might conclude from this:

- It takes a lot of post docs to operate experiments
- For the major projects, overwhelmingly, these post docs come from the U.S.

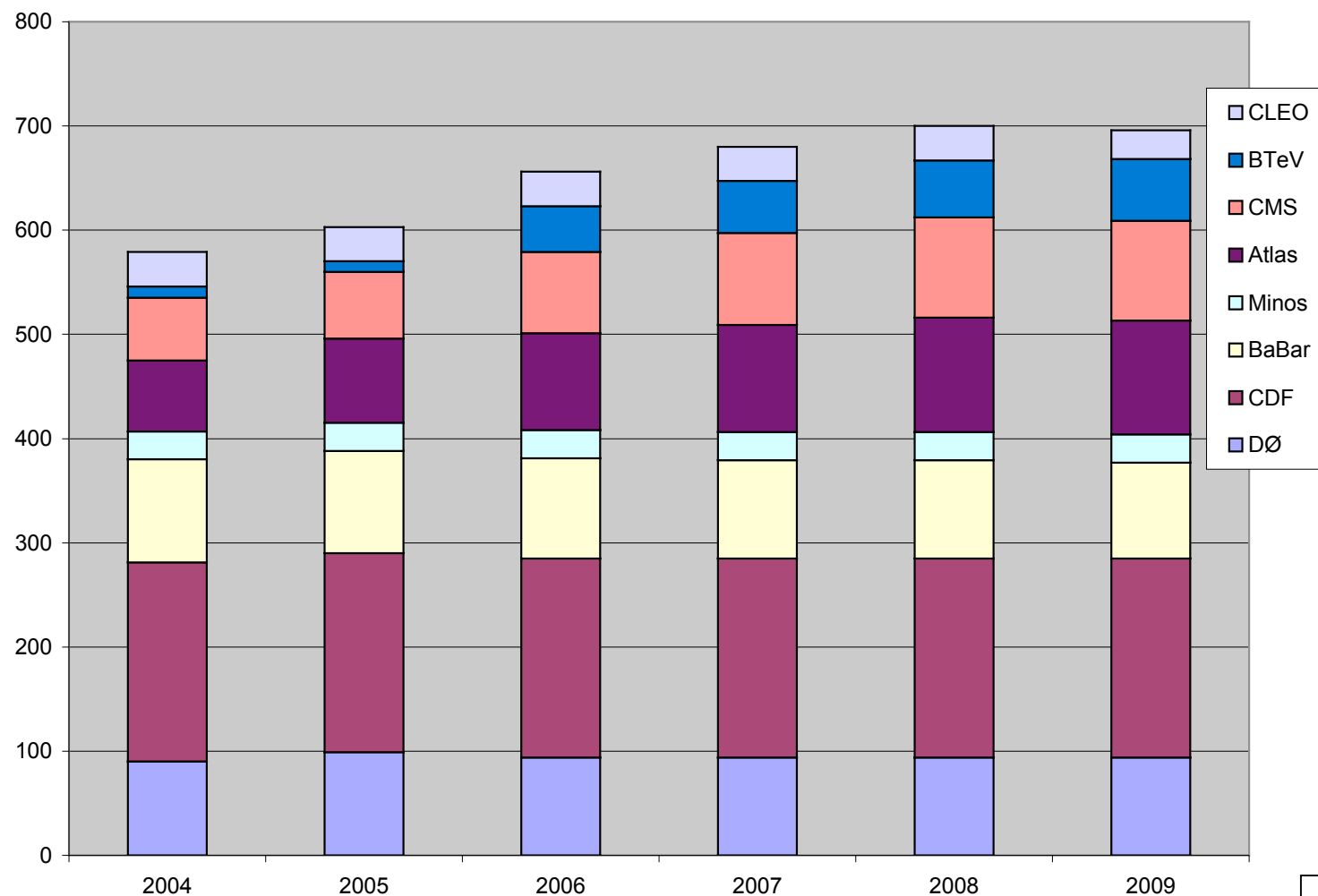
* cms reported only totals - all were labeled "operations" for this exercise



Chip Brock

HEPAP University Program Discussion 19 April 2004

post doc totals



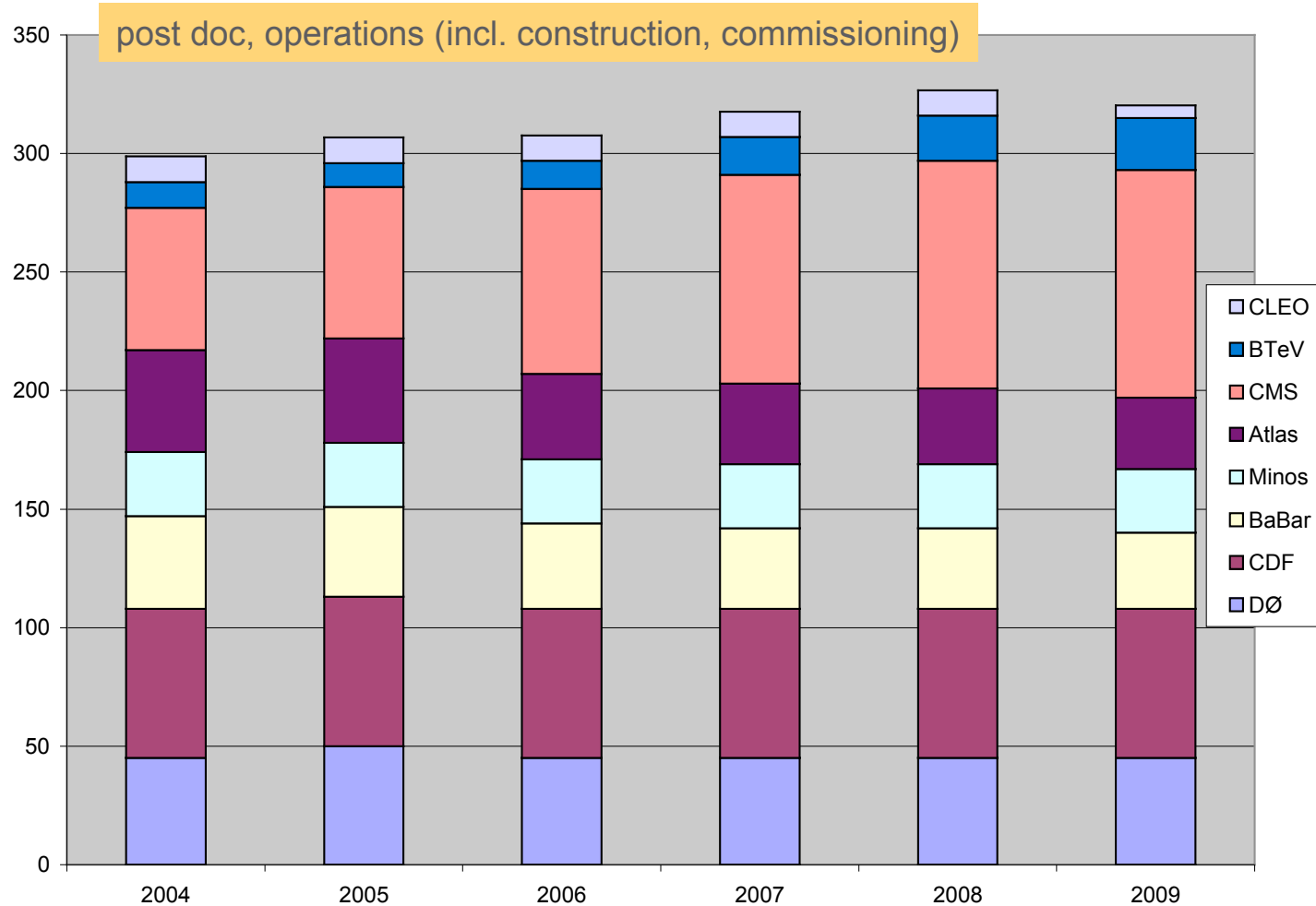
What you might conclude from this:

- The need for post docs goes up

NOTICE

ROUGH ESTIMATE IN PROGRESS
DO NOT QUOTE

post docs, operations



What you might conclude from this:

- No running experiment appears to be able to operate with reduced post doctoral staff



redirection

from what do we redirect?

- *The running experiments estimated of “operations” based on experience*
in some cases, with real bottoms-up estimates
- *They all independently conclude that no decrease in operations personnel is conceivable*
 - *Notably, none of them concluded that increases were necessary*

Atlas, CMS, BTeV

- *have construction/commissioning/operations requirements*
- *the currency in this exercise is not quite the same, as noted*
“redirection” was presumed to be in force for their estimates

Current post doc support may not be sufficient.

conclusions

things we don't understand

the dividing line:

- *how is the division established between the HEP/EPP PI program funding and other priorities - what criteria are used?*
 - take, for example: the “0.5 • Gilman bump”
 - somehow \$5M out of \$700M could not be sustained, in spite of HEPAP's enthusiastic encouragement - how can that happen?

correlations:

- *each agency legitimately makes independent grant decisions on their individual merits*

Can the effects of the sum total of those independent decisions on priority programs be included in PI program planning?

- don't know, but there can be positive or negative coherent effects

Can the combined effects of both agencies' decisions be evaluated?

- don't know, but there can be positive or negative coherent effects

what does HEPAP do now?

proto-conclusions, 1

We might have a problem with PI program support

- *and, with survey, especially with regards to post docs?*

1. This rag-tag analysis needs to be done properly

- *Currencies, especially for PD FTE and “NEED” can be standardized*
- *Experiments can do a more thorough job, and I think would like to*
- *The non-accelerator community must be included*

2. This needs to be done soon

- *We’re at a unique moment*

THE PIPELINE

- *students from CDF, DØ, BaBar are starting to graduate PhDs*
if they don’t see post doctoral opportunities, they will go elsewhere
in two years, our pipeline may be dry and then we’ve got a problem

3. This needs to be done cross-agency

- *current programs will succeed only with both agencies’ PI support*

4. This needs to be done with the correlations included

- *connecting the diffuse PI programS with large projects*

proto-conclusions, 2

Prominence of the University Programs

- *We think that a public mechanism/vehicle should be created to properly characterize what the university groups do*
 - in conceiving, designing, engineering, constructing experiments
 - in data collection, certification, analysis, publication
 - in theoretical work: formal and phenomenological...
 - Remarkably, an empirical field relies for planning on intricate theoretical predictions to guide \$B's of expenditure
 - In contrast, many Tevatron experimental results will be limited by theoretical uncertainties
- *There are human stories and technical triumphs which deserve to be told - it could be an engaging account*
- *The two pillars that support the operation of HEP research could then be placed in their proper balance*
 - The $1/\sqrt{2}$ (BaggerBarish+BarishBagger) report was great
 - readable, complete, listened-to
 - sterile, if not accompanied by a healthy, increasing PI program

summary

Do the effort requirement study right

- *Our embarrassment of facilities riches*
**results in amazing opportunities in Physics –
and the payoff for 1000's of person years of effort and \$100M's of
public money**
 - *BUT only if we get a handle on the realities of the effort required*
- *We need to solidify our needs and mitigate a shortfall in
demographics if called for- NOW*

Characterize the PI Program publicly

- *It needs a more prominent place in the overall scheme of things*
- *and deserves a level of attention within both agencies which is
consistent with the investment in facilities*